

## 2. SCOPE OF WORK AND APPROACH

### 2.1 Scope of Work

The U.S. Department of Energy's Rocky Flats Field Office (RFFO) oversees the Rocky Flats Environmental Technology Site (RFETS), formerly the Rocky Flats Plant. The Rocky Flats Plant was originally part of the U.S. Department of Energy's (DOE) Nuclear Weapons Complex, but it is now being cleaned up under DOE's Environmental Management program. The site was built in the early 1950's. Subsequent additions have increased the original capacity to approximately 3,000,000 square feet of floor space in more than 135 structures. Most of the buildings used in the past for production are over 30 years old, and have unknown amounts of contamination

The primary mission now includes environmental restoration, waste management, and Special Nuclear Material (SNM) management. Since the Secretary of Energy's announcement that plutonium manufacturing and production contingency missions would cease, the new mission of RFETS is directed toward cleanup, deactivation, preparation for decontamination and disposition of facilities, and closure of the site. The new mission must be accomplished in a way that maintains the site in a safe condition for workers, the public, and the environment and in compliance with applicable laws, regulations and agreements.

DOE and RFFO selected Kaiser-Hill Company, LLC (K-H or K-H) to manage and integrate all activities required to close the Rocky Flats plant. K-H previously developed several closure plans, including the recent 2010 Closure Project Baseline (CPB), referred to as the Rocky Flats Closure Plan (RFCP). During June 1998, the Secretary of Energy and the RFFO Manager completed the 2006 Rocky Flats Closure Project Management Plan. On November 19, 1998, the RFFO Manager formally requested that K-H deliver, by May 21, 1999, a Baseline Plan for closure of the Site in 2006. At a minimum, K-H was directed that the Rocky Flats Closure Project Baseline Plan would include:

1. Closure Project Management Plan similar to the one developed for the 2010 Closure project, including a thorough and credible Programmatic Risk.
2. Project Baseline Descriptions (PBDs) defining life cycle work scopes, schedules, milestones and strategies.
3. Cost Profile Summary Reports at the PBD and work Authorization Document (WAD) level over the life cycle of the 2006 Closure Project.
4. The Closure Project Completion metrics for the 2006 Plan.
5. The Milestone Sequence Chart depicting revised milestone dates.
6. The internal Milestone Listing by PBD and WAD in support of the milestones in (5) above
7. The Critical Closure Path schedule along with the revised Expanded Management Summary Schedule supporting Critical Path.

RFFO engaged Ernst & Young LLP (Ernst & Young or E&Y) to determine, using standard practices, the reasonableness of the scope, cost and schedule projections delivered by K-H as part of the 2006 Rocky Flats Closure Project Baseline Plan. In addition, RFFO requested that Ernst & Young assess the potential for the successful implementation of the 2006 Rocky Flats Closure Project Baseline Plan. Ernst & Young has been assisted by two subcontractors in performing this assessment: Currie & Brown Inc. and Kellogg LLC.

The purpose of the assessment is to establish the following:

1. Planning and assumptions are valid and current.
2. The methodology for scope and organization of the work is generally sound.
3. The work scope reflects the appropriate assumptions, technical bases and an understanding of the current conditions.
4. The work logic and task sequencing effectively delivers the desired end state for the proposed schedule.
5. The total cost of the project is integrated with the schedule and appears to be reasonable.
6. The estimating methodology is generally sound and reflects the environment in which the project is being conducted.
- ~~3-7.~~ The bases of schedule and cost estimates are reasonable and at the appropriate level of detail.
- ~~4-8.~~ The uncertainty of work has adequately been addressed and factored into the planning.
- ~~5-9.~~ Factors affecting schedule risks have been identified and are being managed.
- ~~6-10.~~ Factors affecting cost risks have been identified and are being managed.
- ~~7-11.~~ Resources (numbers and types) are identified and properly allocated.

## 2.2 Approach to the Work

The following table lists the technical requirements from the Department of Energy/Rocky Flats Field Office (DOE/RFFO) for the baseline confidence review of the 2006 Rocky Flats Closure Project Plan. We reviewed the 2006 Closure Plan from several perspectives; therefore, the responses to many of the technical requirements are found in more than one section of our report. This table maps the Ernst & Young report sections to the DOE/RFFO technical requirements.

DOE Technical Requirements from RFP	Ernst & Young Report Sections
Planning assumptions are valid and current	4.1
Methodology for scope and organization of work is generally sound	4.2 4.3
Work scope reflects appropriate assumptions, technical bases and an understanding of current conditions	4.1 – 4.7
Work logic and task sequencing effectively deliver the desired end state for the proposed schedule	4.2.2 4.4
Total cost of project is integrated with the schedule and appears to be reasonable	3 4.4
Estimating methodology is generally sound and reflects the environment in which the project is being conducted	4.5.1 4.5.2
Bases of schedule and cost estimates are reasonable and at the appropriate level of detail	4.4 – 4.7
Uncertainty of the work has adequately been addressed and factored into the planning	4.3 – 4.4 4.6 – 4.7
Factors affecting schedule risks have been identified and are being managed	4.4 4.4.7
Factors affecting cost risks have been identified and are being managed (including cost risks that result from schedule risks)	4.5 4.6 4.7
Resources (numbers and types) are identified and properly allocated	4.2

The number and diversity of the tasks required to close the Rocky Flats site caused the review team to develop several approaches to assessing the major parts of the Closure Plan. The following section describes the methods used for the major components of the 2006 Closure Plan.

### *Schedule*

Ernst & Young interviewed various members of K-H's staff to better understand the methodology applied to develop the 2006 Closure Plan Baseline (CPB) Schedule. Understanding how the contractor developed the schedule enabled us to focus our review of the 2006 CPB Schedule and allowed us to deliver more substantive feedback.

The 2006 CPB Schedule is the culmination of three previous closure schedules. When K-H was awarded the contract in 1995, they developed a high level, "top down" type of schedule called the Accelerated Site Action Plan (ASAP) which incorporated approximately 1,600 schedule activities; this cumulative schedule represented a baseline of the overall scope of work to achieve site closure by 2010. The next schedule developed was the Life Cycle Baseline (LCB) schedule. This schedule included approximately 17,000 activities and provided a greater level of detail for the scope of work to achieve site closure. This schedule was resource-loaded and provided K-H with the necessary information to project staffing and personnel requirements as well as funding needs.

The LCB was then used by K-H and the four primary contractors on site (often referred to as the "Four Tops") to develop the 2010 Closure Plan Baseline (CPB) Schedule. The 2010 CPB Schedule that was developed in Primavera Project Planner (P3) had approximately 27,000 activities when it was first published. In this schedule, K-H attempted to fully integrate all of the ongoing Special Nuclear Material operation programs with the activities required to achieve site closure. The organizational structure elements of the 2010 CPB Schedule are the Project Baseline Descriptions (PBDs), which are broken down into Work Authorization Documents (WADs), containing WADlets or Work Breakdown Structures (WBSs). The WADs and WADlets represent the individual projects that must be executed to achieve site closure and contain the individual activities that the contractor(s) will perform on a daily basis.

This 2010 CPB Schedule was a detailed "bottom-up" type schedule that was developed at the WAD and WADlet levels and rolled up to a summary level scope of work as documented in the PBDs. The work activities were given durations by using a template of "quantity of work"-based assumptions developed by K-H. Each quantity-based assumption was reviewed by a Subject Matter Expert (SME) for its appropriateness for each individual room or work area and subsequently the activity durations were modified to reflect the input of the SME.

As each WADlet and WAD was developed through the process noted above, the resources were entered into K-H estimating program Basis of Estimate Tool (BEST), which is part of K-H's project management software called Joshua. BEST then used this information to develop a cost of the work for each activity within each WAD or WADlet. K-H indicated, as part of their fully integrated schedule, that every schedule activity has a corresponding item in the BEST program. These costs and resources were then downloaded back into the 2010 CPB Schedule. Concurrent with the loading of resources into BEST, the resource information was used to calculate the activity durations independent of BEST and P3. P3 then spreads the costs and resources over the scheduled activities. However, P3 was not used to manage non-skilled resources, only to manage resources for Critical Skill Analysis, (i.e., the hiring and training of personnel with SNM skills, and to provide a forecast over a period of time). This

cost and resource flow information is then downloaded back into the Joshua project management system and into a program called PIRS (Planning and Integration Reporting System).

The procedures listed above are still in use and were used in developing the 2006 CPB Schedule. The 2006 CPB Schedule is a revision to the 2010 CPB Schedule that has been accelerated to achieve site closure by 2006. K-H has stated that the bulk of accelerated activities are focused in the Decontamination and Decommissioning areas. Additionally, the organizational structure of the 2006 CPB Schedule remains largely unchanged from the 2010 CPB, and K-H has begun to apply the “Rolling Wave” development methodology in accordance with K-H’s Standard 10 – Scheduling. K-H’s Rolling Wave methodology requires that the current fiscal year and the next fiscal year be the most developed in detail and that the out years may reflect a lower level of detail.

In addition to the P3 2006 CPB Schedule the following schedules also exist and are used for different purposes:

Schedule Document	Use
2006 Management Summary Schedule (MSS) – Revision 2.0	Presentation Tool
2006 Expanded Management Summary Schedule (EMSS) – Revision 2.0	Communication, integration, and Quality control/validation Tool
2006 Critical Path	Presentation Tool
Milestone Sequence Chart Revision 2.0	Presentation Tool
Rev. 7 (1/26/99) Baseline Resource Leveled/Unconstrained Funding/Planning In The Year Prior To Decommissioning/ Associated ER Activities Incorporated chart (“Eye-chart”)	Basis for Facility Disposition Cost Model

The above schedules are manually extracted from the P3 2006 CPB Schedule and should conform to the configuration controlled CPB except when displaying leading information to guide CPB development to be in accordance with the K-H’s Standard. In some cases the basis for the forecasts shown in these schedules can not be found in the P3 2006 CPB Schedule or the forecasts do not match the P3 version. Specific inconsistencies are outlined in Section 4.4. of this report.

The comments, concerns and recommendations found in Section 4.4 of this report are the result of Ernst & Young’s review of those portions of the 2006 Closure Project Baseline (CPB) Schedule we felt were critical to site closure as scheduled in 2006. We did not review all 2006 CPB Schedule assumptions, scope and sequence; we reviewed a representative set of the Work Authorization Documents (WADs) within several critical Project Baseline Descriptions (PBDs).

The Project documentation reviewed included:

- Electronic copy of 2006 Closure Plan Baseline (CPB) Schedule (2K62)
- Electronic copy of 2010 CPB Schedule (CPBT)
- K-H Rocky Flats Closure Project Management Plan (PMP)

- Interviews with the associated K-H Planning & Integration staff
- Various PBD specific scheduling work papers (i.e., sequencing plans, drawings and duration calculations)

After reviewing the PMP and the “2006 Critical Path” bar chart, we elected to review the Special Nuclear Material (SNM) operations, five building clusters inside the PA which account for approximately 68 percent of the D&D scope, Waste Management (PBD 002) and Environmental Restoration (PBD 001 and 013). The building clusters inside the PA which we reviewed include 371, 779, 771/774, 776/777 & 707/750. The Environmental Restoration review focused on PBD 001 and 013 and included PBD 014, WAD 25 Industrial Zone Closure Project since the majority of the environmental restoration cost as well as activities of high schedule criticality are within these areas.

### ***Rocky Flats Cleanup Agreement (RFCA) Compliance***

The overall intent of the RFCA is to facilitate and enhance the ability of a selected sitewide cleanup strategy to effectively meet the end-state criteria set for the Site. In doing so, RFCA specifically leaves the development and implementation of detailed activity, schedule and cost elements to the cleanup plan itself. In short, RFCA is intended to be an enabling mechanism for the RFCP.

Key to the overall success of RFCA in enabling the accelerated closure of RFETS is the incorporation of key features of RFCA into the overall management and direction of the RFCP. The principal aspects of RFCA reviewed for purposes of this evaluation include the following:

- The streamlined regulatory framework imposed at RFETS by RFCA.
- The regulatory milestones and target activities specifically designated in RFCA.
- RFCA’s No Action/No Further Action protocol.
- RFCA’s Dispute Resolution process outlined by RFCA.

Each of these aspects and their impact to the RFCP are discussed in Section 4.2.3.

### ***Site Operations***

To validate the effectiveness of Site Operations, we identified and analyzed specific work activities that we deemed indicative of the highest risk, cost, or “integration” exposure. This approach required a focused and thorough scrutiny of specific WADlets and the schedule and estimating bases that support them. We reviewed a representative number of specifically identified PBDs, WADs, and WADlets within the operations project. A detailed assessment of the WADlets was required to test the management processes because estimating, scheduling and integration assumptions and support reside only within the WADlets. The WADlets provide the most meaningful insight to project protocol and controls.

Our baseline confidence review of operating activities targeted those PBDs, WADs, and WADlets that directly affect the critical path to closure. The level of risk criticality was assessed based on the level of risk or uncertainty that we subjectively assigned to each activity. The risk assessment is comprised of three basic components: cost, schedule, and technical difficulty. Aside from risk and uncertainty, our sample selection was driven by process. The PBDs, WADs, and WADlets that we have selected all “crosscut” one another at different points throughout the project lifecycle, thus allowing us to critique the integration of operating activities within the 2006 baseline. This approach also permits us to analyze methodology and the potential alteration of the critical path to closure due to risk and uncertainty in each operating activity.

By researching risk, process methodology, implementation and integration from a WADlet level, we were better able to analyze the logical composition of the 2006 CPB. While Facility Landlord Functions comprise a significant contribution to project cost and are an important component of mortgage milestone reductions, they were given lower risk priority. Nuclear Operations (“NucOps”) on the other hand represent the essence of the RFCP and for that reason we applied a higher level of scrutiny in this area. Furthermore, NucOps exemplify all three components of risk and have a major bearing on the Project’s closure critical path currently scheduled for 2006.

In consideration of the above, we selected the following PBD’s:

<b>PBD</b>	<b>Description</b>
8	Plutonium Metals & Oxide Stabilization
9	Plutonium Solid Residue Stabilization
12	SNM Shipping
16	Closure Cluster 371
17	Closure Cluster 707/750
18	Closure Cluster 771/774

It should be noted that selection of these PBDs does not suggest that the others are of less importance; the selection was intended to be indicative of the “cross cutting” operational functionality across the project. A complete list of the PBDs, WADs, and WADlets selected for our sample follows in Section 4.5.1.

Each PBD was subject to a high-level review to determine which WAD within the PBD would be selected for analysis. Then we focused on WADs that represented the highest cost and most significant technical and schedule risk. The same essential selection criteria were applied to the selection of WADlets. Upon review of a broad pool of WADlets, we selected a sample that we believed would best demonstrate the following:

- Integration and crosscutting functionality. WADlets which most depended upon coordinated management across activities were selected;



- Management protocol and accountability. WADlets that were assigned the same manager were generally not reviewed. The reason for this was to test the application of policy and procedures. This is based upon the assumption that strong policy and procedures would be proved through implementation consistency across different projects.

After selecting PBDs, WADs, and WADlets for review, we gathered support data pertaining to them which was available through the RFETS intranet network. These documents include the following:

- Project Baseline Descriptions (“PBDs”) including Appendix A - Baseline Cost Detail, Appendix B - Change Control Logs, and Appendix C - Work Authorization Documents (by fiscal year)
- Basis of Estimates (“BOEs”)
- Selected WAD Level Project Performance Reporting (“PPR”)
- Selected P&I Reporting – Cost Performance Reports (“CPR”)
- Selected WAD Spending Variance Reports (“SVR”)
- Primavera Project Planner (“P3”) scheduling data
- Joshua, BEST, P&I Reporting database.

Upon completion of the preliminary document review, we arranged interviews with key personnel from both the K-H project management team and the Department of Energy. Among other things, the interviews were conducted to confirm the assumptions identified in the PBDs, allow explanation of project management reasoning, discover client perceptions of services delivered and to clarify project controls and protocol.

We made guided tours of Buildings 707, 776/777, and 371. The purpose of the tours was to become familiar with the physical plant operations and to better appreciate constraints and encumbrances that are identified in the Bases of Estimate. Building 707 and Building 371 were selected based upon their relative status of completion in the closure work program. From an operations standpoint, these buildings were selected because they will provide the majority of nuclear material processing throughout the project lifecycle. Furthermore, Building 371 will house the PuSPS and is on the critical path for closure by 2006.

After all support documents were reviewed and interviews and inspections were completed, we compared K-H Project Management assumptions and planning to our fact-based findings and the perceptions of the KH Project Team. We also used “Joshua,” a proprietary K-H software package for budgeting and tracking costs, and the P3 reporting tools to analyze how cash flows and resources correlated to key milestones.

### ***Decontamination and Decommissioning***



The following discussion is the result of our review of the 2006 Closure Project Baseline for the D&D scope of work. The intent of this confidence review is to validate the basic methodologies that K-H employed to establish the schedule and cost integral to the PMP. The scale and complexity of the RFCP is such that a thorough examination of all D&D is neither feasible nor, given the intent, appropriate.

It is not intended to be a comprehensive review of all PBDs associated with D&D; instead, it is a representative review of specifically identified buildings which are either highly contaminated or otherwise indicative of K-H's methodology

Accordingly, we selected a number of buildings that we deemed "critical" or otherwise indicative of K-H's methodology for review as will be discussed further below.

The preponderance of D&D scope and estimated cost resides within selected Type III building clusters as follows:

1. Building 371;
2. Building 707;
3. Building 771;
4. Buildings 776/777; and,
5. Building 779.

Of these five, K-H selected the last three building clusters (771, 776/777 and 779) to perform a bottoms up estimate. K-H also selected building clusters 444 and 886 for bottoms up estimating. The latter two were selected because they are critical to the timely closure of the site due to their relationship with other operations.

In order to assess the completeness of scope, accuracy, methodology and consistency of estimating in general, we reviewed both the bottoms up and top down processes. For bottoms up estimating, we reviewed, in some detail, four of the five estimates that were prepared. We did not review the estimate for Building Cluster 886.

The "top-down" estimate produced from FDCM was analyzed by reviewing, verifying and challenging historical data and estimating assumptions that K-H incorporated in the model. Finally, the BEST system was tested to insure all completed "bottoms-up" and "top-down" estimates are accounted for and presented accurately.

### ***Waste Management***

The Waste Management Project (WMP) was evaluated by a detailed review of the electronic copy of the 2006 Closure Plan documents (Revision 2, dated May 21, 1999) which included the:

- 2006 Closure Project Baseline (CPB)
  - Project Management Plan (PMP)
  - Project Baseline Descriptions (PBDs)
  - Cost Estimate Report (CER)
  - Summary Schedule Booklet, and Risk Assessment Plans (RAP)
- We also conducted interviews with personnel at the Department of Energy/Rocky Flats Field Office (DOE/RFFO) and K-H who are directly responsible for the activities associated with the WMP.

The WMP, Project Baseline Description 002, is essentially a site closure support function. WMP provides specific services to other site activities, most importantly, Decontamination and Decommissioning of site facilities and Environmental Restoration clean-up activities. WMP activities typically include storage, treatment (if necessary), packaging, staging and ultimate shipment of the following types of waste:

Low Level Waste (LLW) Process  
 Low Level Waste (LLW) Remediation  
 Low Level Mixed Waste (LLMW) Process  
 Low Level Mixed Waste (LLMW) Remediation  
 Transuranic Waste (TRU)  
 Transuranic Mixed Waste (TRM)  
 Hazardous Waste  
 Sanitary Solid Waste  
 Sanitary Liquid Waste  
 Uncontaminated Debris

These wastes do not include material that is excavated from a remediation, either D&D waste or ER waste treated to specific action levels, that is subsequently replaced or used as fill elsewhere. Only those wastes that require further management (e.g., treatment or [offsite/off-site](#) disposal) are included in the above.

### ***Environmental Restoration***

Figure 5-3 of the PMP identifies three PBDs under the title “Environmental Restoration” (ER):

- PBD-001, Buffer Zone Closure
- PBD-013, Closure Caps
- PBD-027, Analytical Services.

In addition, the functional role of ER crosscuts many important closure projects. Accordingly, there are significant ER activities in many other PBDs. In fact, K-H tracks ER activities in 21 WADs and 13 PBDs.

For the validation studies, certain ER elements were selected for review to represent the full diversity of the important ER closure activities. In general, attention was focused on the high-cost WBS elements. However, other important factors were also considered, including:

- type of ER activity (planning/characterization, construction, monitoring/evaluation)
- location of the activity (industrial zone, buffer zone)
- cost/schedule type (“Level of Effort (LOE)” or “non-LOE”)
- time frame for the work (“early” or “late” in the baseline schedule).

These selection considerations are illustrated in the *WBS Selection Matrix* for the WBS elements reviewed; this matrix is included in Section 4.7.1.

The general approach was to review the selected WBS elements (WADlets) to gain a detailed understanding of important ER activities and to obtain confidence in the processes and level of detail employed in developing the ER closure plan activities. The detailed review of individual WBS elements included a review of scope, schedule, costs and risks, in accordance with the technical requirements of the engagement:

**Scope** — The narrative scope of work for each WBS was evaluated against the Technical Strategy and Fiscal Year Baseline Statement of Work presented in the relevant Project Baseline Descriptions. The primary purpose was to assess, in a qualitative sense, the degree to which the stated scope of work was considered within the technical approach, the relative detail to which scope activities have been identified, and early FY allocation of scope. This evaluation also provides a qualitative assessment of the relative degree to which the anticipated scope of work for a given WBS has been defined, organized and, at least conceptually, planned. This also provides an indication of the extent to which narrative scope definitions match the schedule and cost elements of the WBS, the manner in which the technical strategies are reflected in schedule logic, and the overall scaling of major scope items against broad FY costs.

**Schedule** — The WBS schedule was reviewed from an overview perspective to assess integration with the WBS work scope descriptions, fiscal statements of work, and BOE cost profiles. Where appropriate, the WBS schedule review provides a qualitative indication of overall schedule content and logic with respect to activities and sequencing issues identified in the WBS Technical Approach and FY Baseline Statement of Work. Gross disparities between the various narrative portions of the WBS scope and the WBS schedule are general indications of potential changes or uncertainties in scope or timing of activities, or potential coordination issues between management, planning and/or operational functions responsible for the WBS. This review supplements the more detailed schedule review in Section 4.4.

**Costs** — The WBS costs were reviewed to obtain confidence that the Basis of Estimates (BOEs) were reasonably developed to the appropriate level of detail based on known and anticipated conditions. Larger line item costs were reviewed where appropriate to test the rigor employed in

estimating, and in doing so, to gain a confidence in the estimating process. Where possible, comparisons were made of similar line item costs to validate the WBS for internal consistency. The overall scaling of costs against the WBS schedule was also reviewed to compare the general logic of schedule and cost activity for execution of the WBS scope.

**Risks** — Finally, the principal scope, schedule, and cost assumptions were identified and reviewed for each WBS in order to assess potential risks to the overall WBS performance. These assumptions and risks were considered both within the integrated scope/schedule/cost framework of the WBS itself, as well as within the overall RFCP scope of activities, in order to evaluate both internal and external risk to the WBS.

### ***Risk Management***

The objective of the risk management analysis was to review how K-H undertakes risk management at the Rocky Flats site and to assess the reasonableness of the Schedule Risk Analysis undertaken. This assessment was based on information contained in the Programmatic Risk Management Plan (Revision 0, dated June 16, 1998) and the Schedule Risk Analysis, dated June 30, 1999.

The identification, assessment and management of risk are essential in the effective management and control of projects with the size and complexity of the 2006 Rocky Flats Closure Project. K-H recognizes the importance of risk management and has developed a paper, Programmatic Risk Management Plan (Revision 0, dated June 16, 1999), detailing how risk management principles and techniques have been, and are currently, applied throughout the project. Evidence of quantitative risk management can be found in the various schedules and costs that K-H has so far produced for the project.

Our objective was to assess the reasonableness of the risk management methodology applied by K-H on the 2006 Closure Project by:

- Examining the principles set out in the Programmatic Risk Management Plan
- Reviewing the Schedule Risk Analysis dated June 30, 1999
- Taking into account industry standards and best practice.

In addition to looking at the reasonableness of the methodology, we have also reviewed the application and results of the risk management undertaken within the Schedule Risk Analysis.

We have assessed the reasonableness of the risk management being applied by K-H against current industry standards and best practice as applied to major projects both within and outside the nuclear industry. In the Executive Summary we draw together our main observations of K-H's risk management approach, which are found in Section 4.3, and suggest potential opportunities for improvement in line with industry best practice.